STONE ~~QUARRY~~ PROCESSING OPERATIONS

I. Purpose

To specify guidelines for evaluating expected emissions from ~~a~~ stone ~~quarry~~ processing facilities in a consistent manner for permit approval. This document is intended to be used with either the Stone Processing Plant permit application/emissions spreadsheet or the DEQ Form 7. Greenfield sites always require a permit to construct and operate per 9 VAC 5-80-11 (C) New Sources with no exemption. A permit is required for non-NSPS equipment where the uncontrolled 8760 hr/yr emissions exceed the 9 VAC 5-80-11 (D) Modified Source Exemption Level by emission rate. NSPS affected equipment requires a permit per 9 VAC 5-80-11 (F) New Source Performance Standards. For stationary internal combustion engines, fuel fired dryers, boilers, storage silos, etc., use appropriate boilerplates and procedures.

II. Definitions

A. Facility

Affected facilities are subject to the provisions of NSPS Subpart OOO, Standards of Performance for Nonmetallic Mineral Processing Plants, which includes: nonmetallic mineral processing facilities in fixed or portable plants (process equipment, except for equipment handling hot aggregates or asphalt at an asphalt plants or cement plants) fabricated or manufactured after August 31, 1983 and having a capacity (as defined in Subsection 60.671) equal to or greater than the equipment being replaced, which includes: each crusher, grinding mill, screening operation, belt conveyor, bucket elevator, bagging operation, storage bin, enclosed truck or railcar loading station. For example, a unit that was fabricated or manufactured prior to 9-1-83 but installed after 8-31-83 is not considered an affected facility and would not be subject to NSPS OOO. Note: storage silos that handle cement or lime are not subject to NSPS OOO.

B. Air Classifier

Air classifiers (also called air separators) are used to separate dry, extremely fine (420 microns to 44 microns) particles. The classifiers have an internal fan that generates an upward airflow that lifts the extremely fine particles, while allowing the larger particles to drop. The classifier has a double wall construction that allows the two products to remain separate for further processing. The air is recirculated inside the classifier, but there is some air leakage to the atmosphere. The particulate emissions from the classifier may be considered nil. A classifier may be a NSPS affected facility when used in conjunction with a fines mill (or crusher) or grinding mill.

C. Primary Crusher

Initial crushing of quarry stone normally introduced to the first crusher (jaw, gyratory, etc) to yield an approximate 5" to 6" product. Primary crushing includes the truck dumping, feeder, and discharge emissions.

D. Second. Crusher

Reduction of a sized product normally introduced to a crusher to yield an approximate 1" to 3" product. Includes feeder and discharge emissions.

E. Tertiary Crushing	Reduction of screened product normally introduced to a crusher to yield an approximate 1" or less product. Includes feeder and discharge emissions. Tertiary cone crushers are normally considered totally enclosed by being choke fed in addition to the enclosed discharge chute for spillage control. Normal hourly and annual thruputs often exceed primary thruput due to recirculating load.
F. Fines Mill	Reduction of screened product normally introduced to a ball mill, hammermill, or other types of crusher to yield a powder product such as agricultural lime or manufactured sand. Includes feeder and discharge emissions. May have high hourly and annual thruputs due to recirculating load. When the fines mill circuit include an air classifier, cyclone, and pneumatic conveying equipment, the particulate emissions are included in the fines mill emission factor.
G. Load-Out	Finished stone product transfer to trucks/rail cars. May be used to calculate emissions from loading feed hoppers for wash plants, pugmills, etc.
H. Pugmill	Usually consisting of several feed hoppers, a belt conveyor, a cement silo, and a pugmill mixer. The pugmill is used to blend fine and coarse stone products into a homogeneous mixture with a high moisture content. The last belt conveyor feeding the pugmill mixer is the last emission point at this operation.
I. Reclaiming	Automated stockpile stone recovery belt conveyor system, usually located in a tunnel. Emissions are negligible.
J. Screening	Sizing separation of received or crushed stone product. Screening includes emissions from the feed conveyor, product bins located under the screens, and product discharge chutes. Tertiary screens often have higher hourly and annual thruputs that exceed primary thruput due to recirculating loads.
K. Storage	Product reserve of crushed stone. Usually stored in open piles. Storage emissions generally calculated at 25% to 40% of primary thruput, since the larger size stone products have less than 100 micron size particles by weight and other stone products are washed to remove 100 micron particles. Emissions include product drop emissions from belt conveyors and/or stock trucks, and haul road emissions. Higher truck activity and miles of haul roads within the quarry will result in increased emissions. If not specified by source, use 33% of primary annual thruput.
L. Transfer Point	Stone product transfer directly from one conveyor or bucket elevator to another conveyor or bucket elevator.
M. Surge Bins	Temporarily store stone products (conveyor - bin - conveyor) in

order to balance production capacity of different processing equipment. Using twice the conveyor transfer emission factors accounts for loading and discharge from the surge bin.

N. Unload — Discharge of stone from a vehicle. These emissions have been included in the storage pile and loadout emission factors. However, these emissions may be used in specialized cases (riprap plants, etc.)

O. Wash Plant — (Formerly wet screening) Used to remove the unwanted materials (minus 200 mesh/74 micron particles, dirt, clay, etc) from stone products. The wash plant usually consists of feed hoppers, belt conveyors, a screen, and possibly a sand classifier. The screen has permanently mounted spray bars capable of discharging hundreds of gallons/minute of water which completely saturates the stone and removes the unwanted material from the stone product. The belt conveyor that feeds the wash screen is the last emission point for this type of operation. The ~~proposed~~ revisions to Subpart OOO exempts the wash screen and all downstream production equipment, up to the next crusher, from all provisions of this Subpart, except for a one time notification to EPA Region III.

III. Stone Processing Facility Emission Factors

(Refer to table below)

Source (SCC)	Particulate Matter lbs/ton	PM-10 lbs/ton	% Wet Sup. Cont. Eff.	Ref.*
Screening Pri., Sec., or Tert. (SCC 3-05-020-15)	0.15	0.015	94 94	III.1,
Primary Crushing (SCC 3-05-020-01)	0.00073	0.00071	95 95	III.1,III.2 ,
Secondary Crushing (SCC 3-05-020-02)	0.036	0.0024	96 75	III.1,
Tertiary Crushing (SCC 3-05-020-03)	0.036	0.0024	96 75	III.1,
Fines Crushing (SCC 3-05-020-05)	0.72	0.015	82 87	III.1,
Fines Screening (SCC 3-05-020-21)	0.3	0.071	99 97	III.1,
Conveyor (to conveyor) Transfer Point (SCC 3-05-020-06)	0.026	0.0014	99 97	III.1,
Open Storage (SCC 3-05-020-XX) (includes loading onto the piles, wind erosion, pile activity, and pit haul road)	0.33	0.156	95 95	III.3,III.5 ,III.4III.6
Truck Unloading - Emissions included in primary crushing, used for special cases (riprap plants) (SCC 3-05-020-31)	0.00003	0.00001	95 95	III.1,
Truck/Hopper Loading - Front End Loader (SCC 3-05-020-98)	0.06	0.03	95 95	III.4III.6

* Refer to Reference items 1-6 below.

Notes: For fuel burning equipment (dryers, stationary internal combustion engines) or storage silos, etc, use appropriate emission factors from AP-42 or specific boilerplate procedures.

A. Emission factors represent uncontrolled emissions.

B. Surge bins are considered as 2 transfer operations.

C. Stone product transfers into and out-of crushers or screens are included with the crusher or screen emission factors.

Reference:

1. Emission factor and control efficiency based on Table 11.19.2-2 (July '94), AP-42 by Tom Creasy. Crusher operation includes use of enclosed discharge chutes and covered side skirts on the belt conveyor.

2. Emission factor includes primary crusher feeder and truck unloading.

3. Emission estimates determined as referenced in AP-42, Chapter 13.2 (Fugitive Dust Sources).

4. SCC assigned by VA DEQ, Air Division.

5. Emission factor = 1984 SCC reference.

6. Emission factor based on storage pile PM-10 to filterable PM aerodynamic ratio; AP-42, Table 13.2.2-3.

IV. Emission Controls - Other than wet suppression

1. Partial enclosure (significantly restricts air flow); 70% efficient (dry basis) [example: hooded transfer]

2. Enclosure (completely restricts air flow while allowing opening for material flow); 90% efficient (dry basis) [example: enclosed screening deck unit or fines mill]

3. Baghouse; 99% efficient.

V. Opacity Limits and grain loading (BACT)

1. Baghouse exhausts and tertiary crushing; 7% opacity; filterable PM limit of 0.05 g/dscm (0.022 gr/dscf) for baghouse exhaust. Note: use grain loading for calculating hourly emissions instead of Stone processing Boilerplate emission factors. [example: tertiary crusher or fines mills discharge to fabric filtration]

2. Primary and secondary crushing; 15% opacity.

3. Screening, conveyor transfers, surge bins, loadout, stockpiles, and other non-specified emission points are limited to 10% opacity.

Notes:

A. Enclosure is a control mechanism. Structural enclosures frequently used for maintenance, noise abatement, weather proofing, etc. are not to be confused with enclosures built for air pollution control.

B. No visible emissions from structural enclosure itself (seam leakage, doors, etc.) - opacity limits refer to discharged material flow or mechanically induced air flow vent.

VI. Permit Requirements

1. Completed application (DEQ-Air Form 7 or VAA/DEQ spreadsheet) for any new, modified, or reconstructed process equipment facility:

2. Relocation of a portable emissions unit require notification to and approval from the Department. Portable plant permit conditions and relocation form letters are to be found in portable plant boilerplate. Note: portable plant process units cannot be split up for use at separate production sites unless permitted separately.

3. Applicable NSPS requirements specify the minimum allowable conditions/emissions (Subpart 000). The source site must include crushing or grinding to be subject to NSPS (if a source only involves product storage, conveying, screening, and load-out it is not subject to NSPS).

4. Crushing and screening control to be wet suppression or equivalent (control shall be designed as needed to prevent excess emissions).

5. Allowed particulate emissions to be specified in pounds per hour and tons per year (unless PM t/y is negligible - less than 0.5 t/y). Coding input, for the inventory data base (AIRS), enter the stone processing plant major component (Main Plant, Sand Plant, etc), with the calculated local pollutant emission factors. Allowed emission rates shall not include the 120% predicted emission rate adjustment factor (sometimes used in engineering evaluations to account for E.F. and process variables). Lbs/hr emissions to be based on expected maximum equipment operation; tons/yr emissions to be based on process yearly throughput.

6. Current ~~quarry~~ stone processing permit conditions do not address toxic (non-criteria) emissions.

7. Modeling not normally required (estimated result not currently deemed representative).

8. When including existing source units (source units currently operating at the site) in a permit, unit allowances are based on approved permit conditions and/or applicable existing source rules.

9. EQUIPMENT REPLACEMENT:

   May be handled by DEQ letter, if deemed permit exempt via 9 VAC 5-80-11 (E) Modified Source Exemption Level by Emission Rates. Like-for Like Replacements no longer requires written notification to the EPA in Research Triangle Park

   A. When replacing a piece of equipment that had been fabricated or manufactured prior to 9-1-83 with an affected piece of equipment (fabricated or manufactured after 8-31-83) and ~~of~~ equal to or smaller in size (see capacity and having the same function).

   B. Permittee is subject to the reporting requirements of the NSPS Subpart OOO - Standards of Performance for Nonmetallic Mineral Processing Plants, Sections 60.7 Notification and Recordkeeping and 60.676 Reporting and Recordkeeping (other parts of Subpart OOO are not applicable). See Permit Condition # 18.

   C. When replacing a piece of equipment that had been fabricated or manufactured after 8-31-83, with an affected piece of equipment (fabricated or manufactured after 8-31-83), the equipment replaced is subject to all parts of the NSPS Subpart 000.

D. EPA Region III notification is always required for replacement equipment fabricated or manufactured after 8-31-83 (replacement equipment fabricated or manufactured after 8-31-83 is NSPS applicable). See permit boilerplate condition (#20) referencing permittee notification dates of construction, start-up, etc.

10. Pug Mills are permit exempt, when defined as a process involving an enclosed drum to internally mix (with water) aggregate size to a uniform consistency.

A. Material handling and other associated process steps, requiring a permit, are discussed in other items of this section (ref. V).

B. Not subject to NSPS.

C. Emissions are considered negligible and visible emission evaluations (VEE's) are not required.

11. Wash screens are permit exempt, when defined as a wet screening process with the primary function of removing unwanted material (clay, grit, etc.). ~~Revisions to~~ The current NSPS OOO require a one-time only reporting to EPA in Philadelphia for wash plant equipment (which includes downstream conveyors, loadouts, bins, etc. up to the next crusher. If the washplant equipment is subsequently relocated to a dry portion of the stone processing plant, the relocated equipment is subject to all provisions of NSPS OOO.

A. Material handling and other associated process steps, requiring a permit, are discussed in other items of this section (ref. V).

B. Not subject to NSPS.

C. Emissions are considered negligible and visible emission evaluations (VEE's) are not required.

12. Total screen unit replacement is subject to permitting - damaged screen or screen cloth replacement is not subject to permitting.

13. In-stack performance testing for NSPS affected facilities required to satisfy particulate matter compliance from baghouse exhausts and other control device stack emissions, except for bin (sock filter) vents or storage bins/silo whose emissions are controlled by a single baghouse.

14. Visible emission testing protocol is required when using EPA Test Method 9. In order to establish the design parameters for the wet suppression system, the source operating section of the Emissions Testing Protocol must be completed during the VEE.

15. Refer to "Permit BoilerPlate" for other specific considerations.

VIRGINIA EMISSIONS SPREADSHEET

FOR

AGGREGATE PRODUCING FACILITIES

GUIDANCE DOCUMENT
&
EXAMPLE EMISSIONS CALCULATIONS
for Version 2.0

INTRODUCTION

The emissions spreadsheet (version 1.1 dated September 1, 1995) was developed through a cooperative effort by the Virginia Department of Environmental Quality (DEQ) and the Virginia Aggregates Association (VAA). The current version (v2.0) of the spreadsheet was subsequently updated to include "manufacturer/model no." information along with "modification codes" so that the spreadsheet could become part of the newly developed industry specific air application form. Version 2.0 and version 1.1 have the same calculations, no changes were made in this area. This spreadsheet should accurately calculate emissions from all of the contributing processes at an aggregate processing facility. Every effort has been made to eliminate errors in the spreadsheet and this guidance document; however, neither the VAA nor DEQ warrant the accuracy of the information contained therein. This spreadsheet will calculate actual emissions, potential emissions, uncontrolled emissions and Title V potential emissions.

The PM10 emission factors used in this program are the most recent factors published in AP-42 Table 11.19.2-2 dated January 1995. The Particulate Matter factors are those accepted by the Virginia Department of Environmental Quality as representing the emissions generated in the 100 micron and smaller range. These factors are included in the most recent version of the Boiler Plate Air Permit (June 28, 1995).

The emissions spreadsheet and this guidance document must be used in conjunction with the Boiler Plate Air Permit and Boiler Plate Procedures Document. Many of the terms used here and on the spreadsheet are defined in the other two documents. For brevity, no attempt has been made to duplicate here the information found in these other documents.

PROCESS FLOW DIAGRAM

In order to determine accurate actual process flow amounts (tph, tpy) for each item a current flow diagram for the plant must be used. This flow diagram should show the location of all crushers, screens, conveyors, bins, stockpiles and truck loadout areas. Some type of facility specific ID# should be shown for each item. This ID# can be in the form of a company number, serial number, flow diagram ID number or plant number. These ID#'s will be entered into the spreadsheet as a means of identification for each item.

If a wash plant is located in this facility, all of the items that process this wet material should be clearly identified. These items will not contribute emissions to the facility totals but still should be entered into the spreadsheet.

The Stone Processing Plant should be broken into the major components (Main Plant, Sand Plant, Wash Plant, Pug Mill Plant, etc). Each of the major components should be run separately using the spreadsheet. The permit should limit the throughput for each major component in a manner that is agreeable with the Agency and the Source. List the emissions per current Agency procedures.

ACTUAL PROCESS RATES

	PROCESS ID#
	Actual Processed (t/yr)
	Rated Capacity (t/hr)
	Allowable (t/yr)

In order to determine the actual emissions generated by the plant, the actual process flow rate must be determined for each item in the plant. Most plants keep an accurate record of the tons of aggregate delivered to the primary plant from the pit. This annual amount of aggregate is then processed through the plant in some normal flow pattern that is determined by the desired end products. For permit modifications or new constructions, the actual process throughput should be equal to the allowable throughput. One possible exception is the pugmill/cement silo - see the NOTE below.

One method for determining the actual amount handled by each item is to calculate the percentage of shipments that occurs from each stockpile. This percentage of shipments can be directly related to percentage of production when applied to an extended period of time. For example, if base material accounted for 45% of the shipments for the year it is safe to assume that 45% of the total production ended up at the base material stockpile. The total throughput should then be multiplied by this percentage to determine the annual tonnage amount that was processed to a particular stockpile. Using this method it is not difficult to back track values from the stockpiles through the plant. Also, general knowledge of the percent split from the primary to the secondary to the wash plant is also helpful.

Once this actual annual amount has been determined for each item the information can be shown on the flow diagram for input into the spreadsheet.

NOTE: For cement silos, you will have to calculate the tons of cement, not aggregate, processed annually. The emission factors shown on the spreadsheet include both pneumatic loading of the silo and eventual unloading of the cement into the product (cement treated aggregate).

RATED CAPACITY

PROCESS ID#
Actual Processed (t/yr)
Rated Capacity (t/hr)
Allowable (t/yr)

The rated capacity for each item can be determined from the permit limits or from information available from the manufacturer. If your permit issued by Virginia DEQ lists an hourly restriction for items in the plant this amount should be entered into the spreadsheet as the capacity for that item. If only the crushers and screens have capacity restrictions in the permit, the capacities of the additional items in the plant can be determined by the same flow pattern used in the actual calculations. For example, if screen #3 has a permit restriction of 300 tph and the items downstream in the plant are not included in the permit, this 300 tph would be distributed in a normal flow pattern on these remaining items. These flow amounts would be the restrictions for these additional items based on the fact that they cannot receive any additional material from the restricted screen.

If your permit does not include some sort of hourly production restrictions, the manufactures rated capacity of the primary crusher should be the limit for the plant. It is also important to remember that the normal setting used at the primary crusher should be the opening that is used to determine the capacity. This is included in the definition of capacity as the physical and operational limitation of the facility. The plant is designed in its current configuration to produce specification material for the construction industry. If the crushers were allowed to open to the widest setting the material produced would not be a sellable product.

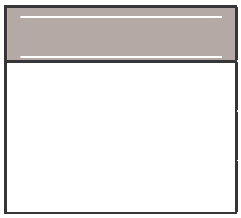
ALLOWABLE THROUGHPUTS

PROCESS ID#
Actual Processed (t/yr)
Rated Capacity (t/hr)
Allowable (t/yr)

If your permit states an annual production limit for the plant or for phases of the plant this amount should be used as the maximum rate the facility is allowed to produce. This amount should then be distributed throughout the plant in a normal flow pattern to determine the annual allowable amount for each item. The allowable throughput is used only as a convenience to remind the operator of the permit limit, it is not used to calculate particulate emissions.

If you do not have annual production limits in your permit or if you are a grandfathered source (only registered) you must hand calculate the limit based on operating at capacity for 8,760 hours a year. For example: 500 tons/hour x 8760 hours/year = 4,380,000 tons/year. This amount should also be distributed through the plant in a normal flow pattern.

NSPS ITEMS



NSPS ?

Dry

Wet

Bag

The last information needed before the spreadsheet can be used is a determination of which process items in the plant fall under the requirements of New Source Performance Standards (NSPS). These items are defined as all crushers, screens, conveyors, bagging operations, storage bins, enclosed truck and railcar loadouts manufactured after August 31, 1983. If your operation contains NSPS items they should be noted on your flow diagram. These items will be the only processes that contribute emissions towards the Title V Potential totals (last column of the spreadsheet) for the site.

DESCRIPTION

At each process item that corresponds to an item in the plant, fill in an appropriate Process ID# for that unit under the "Description" heading. This number should relate to the company number, serial number, plant number or flow diagram number. Alphanumeric entries are acceptable. Also under the Description heading the Actual Processed tonnage (tpy), Rated Capacity (tph) and Allowable tonnage (tpy) should be entered for each unit.

FLAGS

If the item is an NSPS affected unit, the number one □1□ should be placed in the NSPS block under the "Flags" heading. This designation will trigger the program to add this units potential PM10 emissions to the Title V totals for the plant. If the block in front of the NSPS heading is left blank the program will not add in this unit□s emissions to the Title V totals.

The next item under the "Flags" heading is the control method used at the item. If the unit is not permitted (only has a registration number) or has no active control system at the unit or that could contribute to controlling the unit, the dry emission factors must be chosen. This is done by entering the number one □1□ in front of the "Dry" designation. All of the emission totals for this particular plant item will be calculated using the dry emission factors. If the process uses only total enclosure as the air pollution control system (example: fine screening of aglime), the expression (100% - 90% for enclosure) in decimal form will calculate the controlled hourly and expected annual emissions. However, the potential 8760 hr/yr emissions will be incorrectly calculated.

If the item was permitted with wet suppression at the item or with carry-over from wet suppression applied upstream in the process, the "Wet" designation should be used by entering a □1□ adjacent to the word Wet. All emissions from this item will be calculated using the controlled emissions factors shown on the spreadsheet and in the Boiler Plate Procedures Document (Table III, Page 4 of June 28, 1995 version).

If the emissions from the item are controlled by a baghouse, the "Bag" designation should be chosen. The emission factors have already been adjusted based upon an accepted control efficiency listed in the Boiler Plate Air Permit. The dry emission factors are already adjusted by applying a 99% control efficiency. The program will calculate emissions from this item using the baghouse factors.

If the item is included in the wash plant, no emissions are possible from the unit. In order to show this item in the spreadsheet and calculate zero emissions the letters □WP□ or □WET□ should placed in front of the "Wet" designation. No other entries should be present. The spreadsheet treats all alpha characters as zero. This will flag the item as a wash plant unit and will tell the spreadsheet to calculate zero emissions from the item.

Likewise, it is suggested that you list all conveyors on the spreadsheet. Remember, only those conveyors that have a transfer point (belt to belt) will have emissions. For example, discharge out of a crusher onto a belt which then discharges directly to a screen has no transfer point. The transfer emissions are included in the crusher and screen emission factors. For these belts, enter □NTP□ or □NTE□ in the Flags. NTP or NTE specifies that □no transfer points or no transfer emission□ are present and, therefore, no emissions are calculated.

EMISSION TOTALS

Actual Emissions:

The spreadsheet will calculate all of the actual emissions based on the actual processed tonnage amounts entered under the "Description" heading. These tonnage figures will be multiplied by the factors chosen under the "Flags" section. All of the items in the plant will contribute to this total regardless of their NSPS designation. This actual emission total is shown in tons per year for Particulate Matter and for PM10. The PM10 total is the emission total that this site will be charged permit fees on once the permit fee regulations become effective. This will also be the column used to update your annual emissions inventory submitted to DEQ.

Potential Emissions (Controlled)

This column of emission totals is given in pounds per hour for Particulate Matter and for PM10. These numbers are used in the permitting process and are used to verify that the facility remains below any current hourly emission limits set in the permit.

Uncontrolled

These PM10 emissions in tons per year are generated to determine if any of the processes are below the permitting limits set in the Virginia Air Regulations (Appendix R). The program automatically uses the dry factors for these calculations. Currently, Virginia regulations do not provide any exemption for a greenfield plant regardless of the emissions level. However, modifications to an existing plant may not require a permit IF the uncontrolled emissions from the new unit do not exceed the exemption levels set in Appendix R. Currently, this is 10 tons/year of PM10.

Title V Potential

These emissions are based on the allowable PM10 emissions generated solely by the NSPS affected items. The appropriate controlled factors are used for this calculation. This total will be the amount used to determine how this facility will be classified under Title V. If the plant Title V Potential is greater than 100 tons the site may have to complete a Title V application with the state unless additional operating limits are taken. Contact DEQ on available permitting options.

EMISSIONS SUMMARY

All of the individual process category emissions are automatically totaled here. A facility total is also given under each emission category.

VIII0 Other Information

Permits are also required from the Department of Mines, Minerals, and Energy; Division of Mineral Mining, Charlottesville (pit area, equipment installation safety, road accessibility, certified blasters, and foremen). The DEQ-Air Division permit does not cover these matters. The Division of Mineral Resources, Charlottesville, can assist with geologic data information.

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